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Multidisciplinary treatment for chronic pain: a systematic review of interventions and outcomes

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Objectives. To provide an overview of the effectiveness of multidisciplinary treatments of chronic pain and investigate about their differential effects on outcome in various pain conditions and of different multidisciplinary treatments, settings or durations.
Methods. In this article, the authors performed a systematic review of all currently available randomized controlled trials (RCTs) fulfilling the inclusion criteria, by using a recently developed rating system aimed to assess the strength of evidence with regard to the methodological quality of the trials.
Results. Compared with other non-disciplinary treatments, moderate evidence of higher effectiveness for multidisciplinary interventions was shown. In contrast to no treatment or standard medical treatment, strong evidence was detected in favour of multidisciplinary treatments. The evidence that comprehensive inpatient programmes were more beneficial that outpatient programmes was moderate. Fibromyalgia and chronic back pain patients tended to profit more substantially than patients with diverse origins or chronic pain diagnoses. No evidence was found that treatment variables, such as duration or programme components, were influential for the success of the intervention.
Conclusion. A standard of multidisciplinary programmes should be internationally established to guarantee generally good outcomes in the treatment of chronic pain. Our results highlight the lack of quality of design, execution or reporting of many of the RCTs included in this article. Future studies should more specifically focus on differential effects of treatment components and patient variables, allowing the identification of subgroups, which most probably would profit from multidisciplinary pain programmes.

Key words: Back pain, Chronic pain, Fibromyalgia, Multidisciplinary treatment, Systematic review.

Introduction

Chronic pain symptoms cause major medical and socioeconomical problems in industrialized countries due to high direct and indirect costs and are the most common cause of long-term disability in middle-aged people [1]. A great variety of treatment strategies suggest difficulties to treat these patients effectively. Knowing that chronic pain and disability are not only influenced by somatic pathology, but also by psychological and social factors, multidisciplinary interventions for chronic pain have become more accepted in various comprehensive approaches and have rapidly increased in number over the last few decades [2–4]. These are currently based on a cognitive-behavioural principle aimed at reducing disability through the modification of both cognitive processes and environmental contingencies. While cognitive treatment is aimed at modifying maladaptive cognitions on pain and its control, operant-behavioural treatment is designed to support healthy behaviours by reinforcement of those behaviours and through withdrawal of attention from pain behaviour. Time-contingent instead of pain-contingent drug use may be a part of this strategy as well, as is the involvement of the spouse. A third approach focuses on the physiological response system and aims at reducing muscular tension by providing the patient with a model of the relationship between tension and pain and teaching him/her relaxation techniques. It is mostly combined with cognitive techniques. A further common method is 'the graduated activity exposure or pacing, which is an operant-strategy used in the management of chronic pain conditions, to enable patients to control exacerbations in pain by learning to regulate the activity and once a regime of paced activity is established, to gradually increase their activity level' [5].

A comprehensive treatment approach for chronic pain patients includes one or more of these four methods combined with therapies such as physiotherapy, pain management by medication, patient education and ergonomic training. Multidisciplinary treatment has been acknowledged in the past few decades and now finds further expansion [6]. It has been evaluated in many studies and some reviews do exist, but they have their specific limitations.

The first meta-analysis [2] retrieved in our literature search included non-controlled clinical trials. More recent reviews or meta-analyses are either restricted to chronic low back pain [7, 8], fibromyalgia (FM) [9, 10] or investigated behavioural treatment alone and not multidisciplinary approaches [11–15]. Others have not been updated in the last 5 yrs [3], or included different intervention modalities for FM (i.e. pharmacological approach) [16].

For those reasons, the aims of this systematic comprehensive review on multidisciplinary treatment of chronic pain first is to give an overview on multidisciplinary treatment for chronic non-malignant pain in general, second, to compare the results for different pain diagnoses and third, to find out whether a conclusion may be drawn about the efficacy of different kinds of multidisciplinary treatments, settings or durations.

Methods

The updated guidelines for systematic reviews of the Cochrane Collaboration Back Review Group were consulted to determine the inclusion criteria, as well the methods, used in this systematic review [17], some aspects (i.e. quality assessment) were tailored according to the recent literature [18].

Publications were retrieved by comprehensive, computer-aided search on the Cochrane Central Register of Controlled Trials, MEDLINE, CINAHL, EMBASE, PEDro, PSYCINFO and PSYNDEX up to September 2006. A specific search strategy was developed for each database by using the Cochrane methodological filter for randomized controlled trials (RCTs) and combing MeSH keywords and other relevant terms including: 'multidisciplinary, interdisciplinary, patient care team, back pain, fibromyalgia, chronic pain syndrome,' exploded when necessary.

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TABLE 1. GRADE quality assessment criteria [22]

Quality of evidence	Study design	Lower if[a]	Higher if[a]
High	Randomized trial	Study quality −1—serious limitation −2—very serious limitations −1—important inconsistency Directness −1—some uncertainty −2—major uncertainty −1 Sparse data −1 High probability of Reporting bias	Strong association +1—strong, no plausible confounders, consistent and direct evidence +2—very strong, no major threats to validity and direct evidence +1—evidence of a dose response gradient +1—all plausible confounders would have reduced the effect
Moderate	Quasi-randomized trial		
Low	Observational study		
Very low	Any other evidence		

[a]1 or 2: move up or down one/two grade/s.

TABLE 2. Levels of evidence [17]

Strong evidence	Moderate evidence	Limited evidence	No evidence
• Multiple high-quality RCTs with consistent findings	• One high-quality RCT and one or more low-quality RCTs with consistent findings	• One high-quality RCT or • Multiple low-quality RCTs with consistent findings or • Contradictory outcomes of studies with high and low quality	• Only one low-quality RCT or • Contradictory outcomes of studies of the same quality

The secondary search strategy was performed by contacting experts in this field, screening of references of the RCTs included and relevant reviews.

Abstract selection and eligibility criteria

In order to optimize agreement between the two reviewers (L.S. and V.T.), all assessment tools were independently pretested using a few studies and comparing the results. After this pilot stage, L.S. and V.T. inspected the titles and abstracts of all the references retrieved by our search strategy. L.S., V.T. independently assessed the abstracts of relevant papers using a structured form to determine whether the inclusion criteria were fulfilled. In doubtful cases, the article was retrieved in full length and evaluated before making any decision. In case of uncertainties, a third reviewer (H.S.) was consulted.

RCTs were exclusively included. The original study had to deal with adult patients (>18-yrs old) with chronic non-specific musculoskeletal pain (e.g. chronic low back or back pain, FM). At least one study group had to be treated in a multidisciplinary approach in a group setting. To rank as a multidisciplinary treatment, at least three out of the following categories of psychotherapy (PS), physiotherapy, relaxation techniques, medical treatment or patient education, vocational therapy, needed to be part of the programme. At least 2 of the 12 following domains had to be covered: pain, emotional strain, quality of life, disability, coping, physical capacity, return to work, sick leave, use of medicaments, use of the health care system, pain behaviour or subjective overall success. A follow-up (FUP) of at least 3 months had to have been conducted. The studies had to be published in full length in any language and no publication date restrictions were made. To note, we focused, as mentioned in the introduction, on cognitive-behavioural, operant, psychological response system and graded exposure pain management programmes, excluding work-hardening programmes, which have partially the same contents but are otherwise weighted and have generally other primary outcomes.

Methodological quality assessment and levels of evidence

Even though there is still limited empirical evidence [19] of a relationship between specific methodological criteria and bias, it cannot be excluded that methodological flaws, which affect the internal validity of a study may introduce some bias in its results. All trials selected were judged according to a 10-item checklist by two independent reviewers (L.S., V.T.) to describe the methodological quality. 'Assessing the quality of trials in the field of this systematic reviews is faced up to differences regarding pharmacological trial (e.g. influence of experience of the care givers, blinding of the patients not always possible) and therefore specific instruments should be used' [20]. Hence, a recently developed checklist to evaluate reports of non-pharmacological trials (CLEAR NPT [18, 21]) was utilized to assess the methodological quality of the studies included in this systematic review. This checklist was specifically developed to assess the reporting of RCTs assessing non-pharmacological treatment [18, 21]. Many validity questionnaires include the items about comparability of the different groups at baseline and eligibility criteria. As those items are not part of the CLEAR NPT, indeed, we decided to introduce two supplementary items [(11) Comparability; (12) Eligibility criteria]. To draw a conclusion on the quality of evidence, we followed the criteria of the modified GRADE quality assessment, as described elsewhere (Table 1) [22].

We based our conclusions on the effectiveness of the various therapeutic interventions and on the strength of scientific evidence using a rating system with four different levels based on the quality of the studies (Table 2) [17].

Data extraction

Two reviewers (L.S., V.T.) independently extracted data according to a pre-defined protocol and a final version of the data extraction was developed by consensus. The majority of the studies measured various outcomes and our decision about primary and secondary outcomes was somewhat arbitrary. In accordance with the literature, we considered the following domains as primary outcomes: psychological strain, disability in everyday life, health-related quality of life and pain, as well as more appropriate coping strategies, which seem to account for these changes [23]. Physical capacity, return to work rate, sick leave, the use of the health care system, medication, pain behaviour, quality of sleep and other domains (e.g. subjective improvement) were considered as secondary outcomes. Furthermore, we extracted data regarding duration of the multidisciplinary pain programme (weeks and hours), type of interventions of the pain programmes and treatment components, setting and follow-up length.

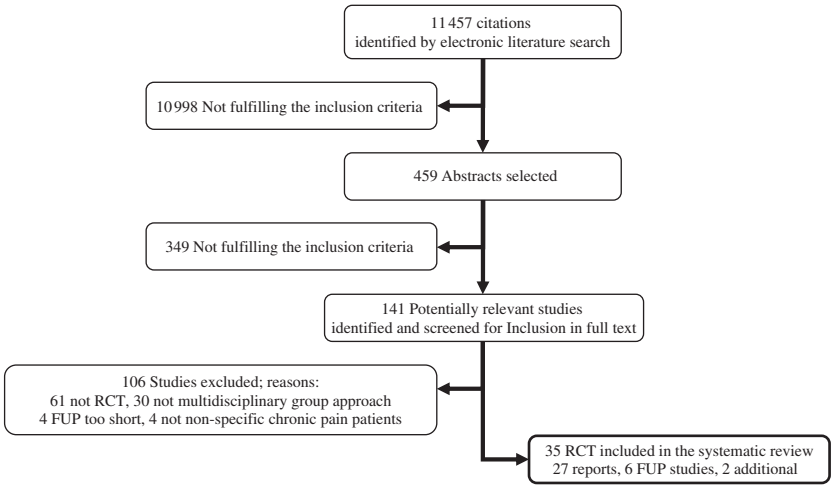

FIG. 1. Flow diagram of included and excluded studies.

Determination of success

Most chronic pain patients have a long clinical history of more or less successful treatments and the goals of therapy have to be realistically adapted to each individual situation. A multidisciplinary treatment was considered as successful if it was more effective than a control treatment [treatment as usual (TAU), waiting list control (WLC), placebo (attention control) or a treatment that did not fulfil our criteria for a multidisciplinary treatment (e.g. either physiotherapy, PS or relaxation techniques solely)]. The higher effectiveness had to be demonstrated in at least two out of the five primary outcomes, or at least in one of the primary and two of the secondary outcomes.

Results

Study selection

We retrieved 11 457 articles with our search strategy. Thereafter, 459 abstracts were selected on the basis of the title, abstract and keywords. Of those 459 abstracts, 141 articles were obtained in full-text version. Finally, we selected 35 articles by personal searching and use of references. The flow chart through the study is reported in Fig. 1.

Upon evaluation, 27 studies did qualify for entry into this review [24–50], 6 FUP studies [51–56] and 2 studies with additional analysis (Table 3) [57, 58]. Of these studies, 21 included patients with chronic low back or back pain [24–28, 32–35, 37, 38, 42, 43, 45, 48, 51–54, 56, 58], 9 included patients with FM [29–31, 36, 39, 41, 46, 49, 57] and 5 included mixed chronic pain patients [40, 44, 47, 50, 55]. Three studies had treatment programmes devoted to women only (two for chronic back pain [33, 35] and one for FM [29] with additional analysis study [57]).

Description of included studies

The number of patients of the studies included, varied between 15 and 214 (median = 86), totalling 2407 patients. The size of the individual treatment groups varied between 3 and 10 patients, but was mostly between 5 and 7.

Eighteen of 27 programmes were performed in an outpatient setting [25, 26, 29–32, 35–37, 39–43, 45–47, 49], five of 27 took place as an inpatient setting [24, 27, 33, 38, 48] (one of these with an outpatient post-treatment after inpatient treatment [38]) and four compared an inpatient with an outpatient setting [28, 34, 44, 50].

The duration of the programmes varied between 4 and 15 weeks for outpatient programmes over 15–135 h (median = 31 h) and between three and eight weeks for inpatient programmes over up to 200 h (median = 150 h). Based on the available data, the median duration of all treatments was 45 h. In order to obtain a better comparability, we tried to classify the multidimensional treatments into treatments with cognitive-behavioural approaches (CBT) and operant-behavioural approaches (OBT), although the authors called it integrated or multidisciplinary group therapy.

Central elements of multidisciplinary therapy

As study settings, populations, interventions and control groups were heterogeneous, we decided not to pool effect sizes in a meta-analysis. Details of the intervention administered were made in all reports (100.0%, Table 4). The 27 studies comprised of 74 groups including 39 with multidisciplinary treatment regimens, 20 with non-multidisciplinary treatment strategies and 15 with WLC or TAU (Table 3).

CBTs are the most common interventions and are used in all studies and in 38 of the 74 treatment groups (48%). OBT is part of the programme in 14 studies [24, 30–32, 35, 37–41, 44, 48, 49, 56]. PS is mainly administered in groups. Individual PS is part of the programme in four studies [26, 38, 47, 56]. This part usually covers 1 or 1.5 h/week, but increases to up to 6 h of group therapy per week. Aerobic exercises were used to foster endurance in 10 studies [24, 26–29, 34, 36, 39, 44, 45, 56] and muscle stretching techniques were part of the physical program in 9 studies [26–29, 31, 34, 36, 37, 50, 56]. Exercise therapy to improve activity tolerance and strengthening were part of 17 studies [24, 26–28, 30, 32–40, 47, 48, 50, 56] and back-education was taught in 4 studies [35, 42, 43, 56]. Hydrotherapy or swimming was used in nine studies [29–32, 34, 42–45].

Biofeedback training was performed in six studies [24, 38, 44, 46, 48, 49]. Progressive muscle relaxation [59] was part of the programme in eight studies [25, 30, 32, 35, 37, 41–43] and 'autogenic training' [60] was part of the programme in one study [36]. Twelve studies used other less common techniques (e.g. applied relaxation) [24, 27–29, 33, 39, 40, 44, 45, 47, 49, 50].

A medical doctor was part of the team in eight studies [31, 32, 34, 35, 39, 40, 44, 47]. His/her task was mostly the adaptation and/or reduction of the medication, as well as information about the patho-physiological processes of chronic pain.

Patient education was often an integral part of the therapy. In 16 studies, some sort of patient education was conducted [24–27, 30–33, 37, 39, 41, 44–46, 49, 50, 56]. Other elements that were part of the therapy were ergonomic training [25, 32, 35, 37], vocational therapy or occupational therapy [24, 27, 30, 34, 35, 38, 40, 44, 47, 56], nutritional counselling [31, 39, 42, 43] or therapeutic massage [39].

TABLE 3. Characteristics of studies included ($n = 35$)

Reference; FUP study	Diagnosis	Total *n* in the study	*n* in the treatments groups	FUP (months)	Multidimensional treatment: setting, duration in weeks (w) and total hours (h)	Non-multidimensional control treatment: setting, duration in weeks (w) and total hours (h)	Domains of measurements (Bold shows significant results at post measurement, cursive at FUP)											Quality of evidence according to GRADE [22]
							Pain[a]	Emotional strain[b]	Quality of life[c]	Disability[d]	Coping[e]	Physical capacity[f]	RTW/sick leave[g]	Drug intake[h]	Use of HCP[i]	Pain behaviour[j]	Other[k]	
Linton and Gotestan [40]	Mixed CP	15	5	9	OBT + AR: out, 4 w, ?80 h	AR out, 5 w, 7.5 h WLC 4 w	*NRS*	BDI VAS		*ADL*	–	–	–	*X*	–	–	27	Low
Peters and Large [44] FUP in: Peters *et al.* [55]	Mixed CP	22	6–10	12	CBT + OBT: in, 4 w, 200 h CBT: out, 9 w, 18 h	TAU	*VAS* MPQ PD	BDI	GHQ	SIP	–	–	–	X	–	*PBC* Video	*21.25* 29	Low
Nicholas *et al.* [42]	CBP	58	5	12	2 CBT groups with/without relaxation + PT out, 5 w, 17.5 h 2 OBT groups with/without relaxation + PT ut, 5 w, 17.5 h	PT + discussion out, 5 w, 17.5 h PT out, 5 w, 17.5 h	PRC	*BDI STAI*	–	*SIP*	*CSQ PBQ*	–	–	*D*	X	–	–	Moderate
Altmaier *et al.* [24] FUP in: Patrick *et al.* [54]	CBP	45	?	6	OBT + CBT + TAU in, 3 w,? h	TAU in, 3 w ? h	*MPQ*	*WHYMPI*	–	*LBPRS*	SE	–	X	–	–	–	–	Moderate
Nicholas *et al.* [43]	CBP	20	5	6	CBT + PT out, 5 w, 17.5 h	Attention control + PT out, 5 w, 17.5 h	PRC	BDI	–	*SIP*	*CSQ* PBQ *PSEQ*	–	–	X	X	–	27	Moderate
Burckhardt *et al.* [29] Lomi *et al.* [57]	FM women	99	5–6	6	CBT + PT out, 6 w, 15 h	PE; out, 6 w, 9 h WLC, 12 w	FIQ	BDI	QOLS	*FIQ*	FAI SELF ASES	Div.	–	–	–	–	*23*	Low
Vlaeyen *et al.* [48]	CBP	71	4	12	OBT + CBT; in, 8 w, ?h	OBT; in, 8 w, ? OBT + AR, in, 8w, ?	VAS	*BDI*	–	–	*PCL*	–	–	–	–	*CHIP BAT*	–	Low
Bendix *et al.* [26] FUP in: Bendix *et al.* [56] Bendix *et al.* [52] Bendix *et al.* [51]	CBP	132	6-8	60	CBT + physical training out, 6 w, 135 h	Physical training out, 6 w, 24 h PS + physical training, out, 6 w, 24 h	*NRS*	–	–	*NRS*	–	–	*X*	X	*X*	–	*21.22*	Low
Bendix *et al.* [27] FUP in: Bendix *et al.* [52] Bendix *et al.* [51]	CBP	106	7	24	CBT + physical training in, 3 w,117 h	TAU	*NRS*	–	–	*NRS*	–	–	*X*	X	*X*	–	–	Low
Vlaeyen *et al.* [49]	FM	131	6	12	CBT + OBT; out, 6 w, 42 h PE + discussion out, 6 w, 42 h	WLC; 8 w	MPQ	BDI FSS-III-R MOCI	–	–	CSQ PCL MPCL	–	–	–	–	UAB CHIP BAT	24	Moderate
Williams *et al.* [50]	Mixed CP	121	10	12	CBT; in, 4 w, 140 h CBT; out, 8 w, 28 h	WLC	VAS MPI	*BDI* STAI	–	SIP	PSEQ *CSQ* PCQ	*Div.*	–	X	X	–	27	Moderate
Basler *et al.* [25]	CBP	94	5–8	6	CBT + PT + medical treatment out, 12 w, 30 h	TAU	*D*	–	–	*DDS*	HCS	–	–	–	–	–	22	Moderate
Keller [37]	CBP	65	9	6	OBT + CBT out, 6 w, 45 h	WLC	*NRS*	CES-D	*WBQ*	PDI	SE	*Div.*	–	–	–	*Video*	–	Low

Rose [45]	CBP	102	5–10	6	6 CBT groups; comparison of individual and group therapy and of 1 w (15 h, 30 h) or 1.5 w (60 h) out	No non-multidimensional control treatment	VAS	ZDI	–	*RMDQ*	PLOC PSEQ	–	–	–	–	–	*26*	Low
Jensen *et al.* [33]	CBP women	63	?	18	2 CBT groups; both: in, 5 w, 200 h	No non-multidimensional control treatment	VAS	*BDI*	GSI	*DRI*	*CSQ RAI*	–	X	–	–	–	22	High
Nicassio *et al.* [41]	FM	86	3–7	6	OBT + CBT out, 10 w, 15 h	PE + discussion out, 10w, 15 h	FIQ MPQ	*CES-D*	QWB	–	RAI PMI	–	–	–	–	PBCL OPB	23	Low
Keel *et al.* [36]	FM	32	8	3	CBT out, 15 w, 30 h	Autogenic training out, 15 w, 30 h	*D*	–	–	–	LOC	–	–	D	D	–	21	Moderate
Kole-Snijders [38] Spinhoven *et al.* [58][m] Non-standardized OBT WLC	CBP	148	5	12	OBT + CBT In, 5 w + out, 3 w), 160 h	OBT + group discussion, in, 5 w + out 3 w	VAS	*BDI FSS-III-R*	–	–	*CSQ MPLC PCL*	BAT	–	–	–	*PBS CHIP*	25	High
Gowans *et al.* [31]	FM	41	?	6	CBT + OBT out, 6 w, 18 h	WLC	–	–	–	*FIQ*	*ASES*	*Div.* RPE	–	–	–	–	*24*	Moderate
Bendix *et al.* [28]	CBP	127	?	12	CBT + physical training In?, 3 w, 117 h	Physical training Out, 8 w, 36 h	NRS	–	–	*ADL*	–	X	–	X	–	–	*21*	Moderate
Jensen *et al.* [32] FUP in: Jensen *et al.* [53]	CBP	214	4–8	36	CBT + PT; out, 4 w, 134 h	TAU PT; out, 4 w, 80 h CBT; out, 4 w, 54 h	–	–	*SF-36*	–	–	–	*X*	–	X	–	–	High
Soares and Gross [46]	FM	53	3–5	6	PE Out, 10 w, 102 h	CBT + AR out, 10 w, 120 h WLC	D MPQ PQ	*SCL-90R*	–	FIQ	*CSQ ASES*	–	–	X	–	–	30	Low
Turner-stokes *et al.* [47]	Mixed CP	113	8–10	12	CBT; out, 8 w, 32 h	Individual PS; out, 8 w, 8 h		*BDI WHYMPI* STAI	–	–	–	–	–	X	–	–	–	Moderate
Jousset *et al.* [34]	CBP	86	?	6	PT + OT + medical treatment In, 5 w, 150 h	Individual PT out, 5 w, 15 h	*VAS*	*HAD*	*DPQ*	*QBPD*	–	*Div.*		*X*	–	–	–	Moderate
Cedraschi *et al.* [30]	FM	164	8–10	6	CBT + OBT out, 6 w, 18 h	WLC	RPS	–	*PGWB* SF-36	*FIQ*	–	–	–	–	–	–	23, 27	High
Lemstra and Olszynski [39]	FM	79	?	15	CBT + OBT + PT; out, 6 w, 31 h?	TAU	*VAS*	*BDI*	*PDI*	–	–	–	X	*X*	–	–		High
Kääpä *et al.* [35]	CBP women	120	6–8	24	CBT + OBT out, 8 w, 70 h	Individual PT; out, 6–8 w, 10 h	*NRS*	DEPS	WBQ	*OSW*	–	–	*X*		*X*	–	*28*	High

[a]Pain: VAS: Visual Analogue Scale; D: diary; NRS: Numeric Rating Scale; FIQ: Fibromyalgia Questionnaire; MPQ: McGill Pain Questionnaire; PRC: pain rating chart; PD: pain drawings; RPS: regional pain score. [b]Emotional Strain: BDI: Beck Depression Inventory; MSPQ: Modified Somatic Perception Questionnaire; ZDI: Zung Depression Inventory; ADS: Allgemeine Depressivitätsskala: CES-D: Center for Epidemiological Studies – Depression Scale; STAI: State-Trait Anxiety Inventory; FSS-III-R: Fear Survey Schedule; MOCI: Maudsley Obsessive Compulsive Inventory; VAS-D: VAS for Depression; WHYMPI: West Haven Yale Multidimensional Pain Inventory; POMS: Profile of Mood States; HAD: Hospital Anxiety Depression. [c]Quality of Life: GSI: Global Self Rating Index; WBQ: Well-Being Questionnaire; QWB: Quality of Well-Being Scale; QOLS: Quality of Life Scale; GHQ: General Health Questionnaire; DPQ: Dallas Pain Questionnaire. [d]Disability: NRS: Numeric Rating Scale; RMDQ: Roland and Morris Disability Questionnaire; DRI: Disability Rating Scale; PDI: Pain Disability Index; DDS: Düsseldorf Disability Scale; SIP: Sickness Impact Profile; FIQ: Fibromyalgia Impact Questionnaire; LBPPS: Low Back Pain Rating Scale; QBPD: Quebec Back Pain Disability. [e]Coping: CSQ: Coping Strategies Questionnaire; MPLC: Multidimensional Pain Locus of Control Scale; PLOC: Pain Locus of Control Scale; PCL: Pain Cognition List; LOC: Locus of Control Scale; PSEQ: Pain Self Efficacy Questionnaire; RAI: Rheumatology Attitudes Index; SE/SELF: Self Efficacy Scale; ASES: Arthritis Self-efficacy Scale; HCS: Heidelberg Coping Scale; PMI: Pain Management Inventory; FAI: Fibromyalgia Attitudes Index; PBQ: Pain Beliefs Questionnaire [f]Physical capacity: Div.: Diverse Tests; RPE: Rate of perceived exertion. [g]Return to work/sick leave: X: not specified. [h]Drug consummation: D: Diary; X: not specified. [i]Consultation of HCP: D: Diary; X: not specified. [j]Pain Behaviour: PBS: Pain Behaviour Scale; CHIP: Checklist for Interpersonal Pain Behaviour; PBCL: Pain Behaviour Check List; OPB: Observed Pain Behaviour; UAB: University of Alabama at Birmingham Pain Behaviour Scale; BAT: Behavioural Approach Test. [k]Other: 21: subjective improvements; 22: days of absence at work; 23: Tender Points; 24: Knowledge (FM); 25: Activity; 26: MSPQ: Modified Somatic Perception Questionnaire; 27: Satisfaction/Expectancy; 28: Subjective working ability; 29: ISCRG: Illness Self-construct repertory grid; 30: KSQ: Karolinska Sleep Questionnaire. [l]Burckhardt *et al.* [29]; Lomi *et al.* [57], same study sample, in Lomi *et al.* [57] additional analysis of the ASES. [m]Kole *et al.* [38], Spinhoven *et al.* [58], same sample, in Spinhoven *et al.* [58] additional analysis. AR: applied relaxation; PT: physiotherapy; OT: occupational therapy; PE: patient education; In: inpatient setting; Out: outpatient setting. mixed CP: groups with patients with pain of mixed localization or origin; HCP: health care professionals; RTW: return to work; ?: No detailed information in the original article.

TABLE 4. Numbers (%) of the rated articles ($n=27$) without FUPs and additional analysis[a] with corresponding CLEAR NPT [18, 21] (modified) items

Items of the CLEAR NPT [18, 21] (modified)	Yes	
	n	%
(1) Was the generation of allocation sequences adequate?	21/27	77.8
(2) Was the treatment allocation concealed?	7/27	25.9
(3) Were details of the intervention administered to each group made available ?	27/27	100.0
(4) Were care providers' experience or skill in each arm adequate?	13/27	48.1
(5) Was participants (e.g., patients) adherence assessed quantitatively?	9/27	33.3
(6) Were participants adequately blinded?	3/27	11.1
(6.1) If participants were not adequately blinded were all other treatments and care (i.e., co-interventions) the same in each randomized group?[b]	4/24	16.7
(6.2) Were withdrawals and lost to FUP the same in each randomized group?[b]	6/24	25.0
(7) Were care providers or persons caring for the participants adequately blinded?	3/27	11.1
(7.1) If care providers were not adequately blinded were all other treatments and care (i.e., co-interventions) the same in each randomized group?[b]	4/24	16.7
(7.2) Were withdrawals and lost to FUP the same in each randomized group?[b]	6/24	25.0
(8) Were outcome assessors adequately blinded to assess the primary outcomes?	7/27	25.9
(8.1) If outcome assessors were not adequately blinded, were specific methods used to avoid ascertainment bias (systematic differences in outcome assessment)?[b]	0/20	0.0
(9) Was the FUP schedule the same in each group?	25/27	92.6
(10) Were the main outcomes analysed according to the intention-to-treat principle?	10/27	37.0
(11) Comparability at baseline	25/27	92.7
(12) Eligibility criteria	25/27	92.6

[a]FUP studies ($n=6$) and additional analysis ($n=2$) studies not included. [b]Item (6.1), (6.2), (7.1), (7.2), (8.1): If main item 'Yes', those questions are not to be answered.

Methodological quality of the studies

Table 4 shows the items of the CLEAR NPT of the 27 studies included without FUP studies and the additional analysis studies. The generation of allocation sequences was considered adequate in 77.8% of the trials and only in 25.9% of the reports, the treatment allocation was concealed. Based on the information available in the text, we judged the care providers' experience or skill in each arm being adequate in 48.1% of the included studies, though the information were rather scarcely reported. The participants' adherence was assessed quantitatively in just 33.3% of the included reports. Blinding was adequately reported for the participants in only 11.1% of the studies, for care providers in 11.1% and for the outcome assessors in 25.9%. When the blinding criterion was not fulfilled, co-interventions were the same in each randomized group in 16.7% of the studies. Withdrawals and losses to follow-up were the same in each randomized group in 25.0% of the studies. In most of the papers included, there was insufficient information to make a decision for the items 6.1–6.2 and 7.1–7.3 ('Unclear' 75.0–25.0% and, respectively, 75.0–29.1%).

No specific methods were used to avoid ascertainment bias (0.0%). The FUP schedule was the same in each group in almost all studies (92.6%). The median of the length of the FUP is 12 months. An intention-to-treat analysis was calculated in 37.0% of the articles. The baseline comparability was fulfilled in 25 articles (92.7%). The same results were shown for the declaration of the eligibility criteria (92.7%).

Table 3 shows the overall design quality of the studies included. Only six studies were ranked as high-quality studies [30, 33, 35, 38, 39, 61] according to the GRADE definition (Table 1) [22].

Comparison of multidisciplinary treatment vs WLC or TAU

Fifteen studies comparing multidisciplinary treatment *vs*. WLC or TAU [24, 25, 27, 29–32, 37–40, 44, 46, 49, 50] showed strong evidence that a multidisciplinary treatment is superior to a standard medical treatment or WLC (Table 5). Thirteen studies reported positive results [25, 27, 29–32, 37–40, 44, 49, 50], and two did not demonstrate positive results [24, 46]. Results of long-term FUPs were not available for this comparison in all studies, as patients from waiting lists often entered the treatment programme after the post-assessment, due to ethical reasons. The differences after treatment were maintained at FUP in those studies where results were described.

Comparison of multidisciplinary treatment vs other control group treatments

Fifteen studies comparing multidisciplinary treatment *vs* non-multidisciplinary control group treatment (e.g. physiotherapy with discussion group, patient education) were identified [26, 28, 29, 34–36, 38, 40–43, 46–48, 61]. Together they showed moderate evidence that a multidisciplinary treatment is more effective. In five studies, the results indicated no significant difference between the groups [28, 35, 41, 46, 47]. Where success was recorded, it was maintained at FUP (Table 5).

Comparison inpatient vs outpatient programmes

Four studies directly compared inpatient and outpatient programmes [28, 34, 44, 50]. Three of them demonstrated moderate evidence for superior long-term effects of intensive inpatient programmes. One study showed no differences [28]. Notably, the inpatient programmes were much more intensive than the outpatient programmes (Table 3).

Comparison of effects for groups with different pain diagnoses

There is moderate evidence that a multidisciplinary programme is more effective than no treatment or non-multidisciplinary treatment for chronic back pain patients. Six of seven studies comparing it with a WLC or TAU had positive results [25, 27, 32, 37, 38, 48], as well as the 8 of 11 studies comparing it with another treatment showed moderate evidence that a multidisciplinary treatment is more effective [26, 32–34, 38, 42, 43, 48]. In five studies, no differences were shown between the groups [24, 28, 35, 45, 61].

In FM, there is moderate evidence that a multidisciplinary programme is more effective than no treatment. Three studies [30, 31, 49] showed positive results for a multidisciplinary treatment *vs* a WLC, on the other hand two studies did not show any difference [29, 46].

In two studies, the comparisons with other treatments did not show any difference [29, 41]. Only two studies showed a superiority of the multidisciplinary group [36, 39].

There was limited evidence that a multidisciplinary programme for mixed chronic pain patients was more effective compared with TAU or WLC [40, 44, 50]. No difference were shown for other treatment strategies [47].

TABLE 5. Results according to the determination of success

Study	Success at post measurement	Success at FUP	Success at long-term FUP
Linton and Gotestam [40]	AR, AR + OBT > WLC	AR > AR + OBT	–
Peters and Large [44] FUP in: Peters *et al.* [55]	CBT in > TAU; CBT out > TAU CBT in = CBT out	CBT in > CBT out > TAU	CBT in > CBT out > TAU
Nicholas *et al.* [42]	CBT + AR + PT, CBT + PT, OBT + AR + PT, OBT + PT > discussion + PT, PT OBT + AR + PT, OBT + PT > CBT + AR + PT, CBT + PT	BT + AR + PT, CBT + PT, OBT + AR + PT, OBT + PT > discussion + PT, PT	–
Altmaier *et al.* [24] FUP in: Patrick *et al.* [54]	OBT + CBT = TAU	OBT + CBT = TAU	OBT + CBT = TAU improvements maintained
Nicholas *et al.* [43]	CBT > attention control	CBT > attention control	–
Burckhardt *et al.* [29] Lomi *et al.* [57]	CBT + PT > WLC Patient education > WLC CBT + PT = patient education	CBT + PT = patient education	–
Vlaeyen *et al.* [48]	OBT + CBT, OBT, OBT + AR > WLC OBT + CBT, OBT + AR > OBT	OBT + CBT, OBT, OBT + AR > WLC OBT + CBT, OBT + AR > OBT OBT + CBT > OBT, OBT + AR	–
Bendix *et al.* [26] FUP in: Bendix *et al.* [56] Bendix *et al.* [52] Bendix *et al.* [51]	CBT > physical training CBT > PS and physical training	CBT > physical training CBT > PS and physical training	CBT + OBT + PE > PS + physical training, physical training
Bendix *et al.* [27] FUP in: Bendix *et al.* [52] Bendix *et al.* [51]	No results in the article	CBT > TAU	CBT > TAU
Vlaeyen *et al.* [49]	CBT + OBT = PE + discussion > WLC	CBT 1 = CBT 2 > WLC	–
Williams *et al.* [50]	CBT in > CBT out > WLC	CBT in > CBT out	–
Basler *et al.* [25]	CBT > TAU	CBT > TAU	–
Keller *et al.* [37]	CBT + OBT > WLC	Improvements maintained	–
Rose *et al.* [45]	Individual = group; 15 h = 30 h = 60 h all CBT groups successful	Individual = group; 15 h = 30 h = 60 h Improvements maintained	–
Jensen *et al.* [33]	CBT women > CBT general	CBT women > CBT general	–
Nicassio *et al.* [41]	OBT + CBT = patient education + discussion	OBT + CBT = patient education + discussion	–
Keel *et al.* [36]	CBT = autogenic training	CBT > autogenic training	–
Kole-Snijders *et al.* [38] Spinhoven *et al.* [58]	OBT + CBT = OBT + discussion OBT + CBT, OBT + discussion > PS + PT OBT + CBT, OBT + discussion > WLC	OBT + CBT = OBT + discussion OBT + CBT, OBT + discussion > PS + PT	–
Gowans *et al.* [31]	CBT + OBT > WLC	CBT + OBT > WLC	–
Bendix *et al.* [28]	No results in the article	CBT + physical training = physical training	–
Jensen *et al.* [32] FUP in: Jensen *et al.* [53]	No results in the article	CBT + OBT, CBT, PT = TAU CBT, PT > TAU (women) CBT + OBT, CBT > TAU (women)	CBT + OBT > CBT, PT > TAU (women)
Soares *et al.* [46]	CBT > PE = WLC	CBT = PE = WLC	–
Turner-stokes *et al.* [47]	CBT = individual PS	CBT = individual PS	–
Jousset *et al.* [34]	No results in the article	PT + OT + medical treatment > PT PT + OT + medical treatment = PT	–
Cedraschi *et al.* [30]	No results in the article	CBT + OBT > WLC	–
Lemstra Olzynski [39]	CBT + OBT + PT > WLC	CBT + OBT + PT > WLC	–
Kääpä *et al.* [35]	CBT + OBT = PT	CBT + OBT = PT	–

>: first group has significantly better results than the second group; =: no significant difference between the two groups. Bold shows significant results in at least two of the primary outcomes or in at least one primary and two secondary outcomes

Comparison of different multidisciplinary programmes

Four studies compared different kinds or duration of multidisciplinary treatments [33, 42, 45, 49]. There is no evidence that a special kind, duration or setting of multidisciplinary treatment as described in the evaluated studies is superior to any of the other study regimens (Table 5).

Success in connection with measurements

The range of instruments to assess the various domains of interest is very broad. In fact, in each domain, 6–12 different instruments were administered. There is no tendency that special domains or certain instruments show successful results more often and are more sensitive than others (Table 3). Most of the RCTs used instruments to assess coping strategies (16/27; 59.3%), emotional strain (19/27; 70.4%), health-related quality of life (10/27; 37.0%) and/or disability outcomes (19/27; 70.4%). Remarkably, pain measurement was rarely reported as a primary outcome (88.9%).

Discussion

This article provides the most current and comprehensive review of the existing evidence of the efficacy of multidisciplinary pain programmes and represents an unique evaluation with a detailed overview of the outcome instruments and intervention in multidisciplinary pain programmes. With reference to our first aim, it seems that a minimum standard of multidisciplinary therapy can be currently established from these data, namely ideally: specific individual exercising, regular training in relaxation techniques, group therapy led by a clinical psychologist (1.5 h) per week, patient education sessions once a week, two physiotherapy treatments per week (CBT) for pacing strategies, medical training therapy and neuro-physiology information given by trained physician.

The efficacy of such programmes is not only better than standard medical treatment, but also better than other non-multidisciplinary treatments. Therefore, the set-up of multidisciplinary programmes for chronic pain patients appears to be reasonable and patients should be referred to adequately specialized institutions, instead of being sent to various individual medical specialists sequentially.

In relation to our second aim, the results seen in patients with mixed chronic pain are definitely less beneficial as compared with the promising studies with FM and chronic back pain patients, and should be a question of further investigation. FM as well chronic back pain are different but share some similarities. In fact, both musculoskeletal disorders are strongly associated to a behavioural component, i.e. fear avoidance, over-under activity, passive coping strategies, etc. Additionally, we observed that both diagnostic groups have maladaptive beliefs about the explanation of the pain (catastrophizing behaviour, structural damage, kinesiophobic disturbs, high level of depression, distress).

Our third aim was to assess different kinds of multidisciplinary programmes. Intensive inpatient programmes seem to be more effective, which is consistent with the findings of Guzman *et al*. [7]. Such programmes may be justified for patients with more severe disabilities. Regarding treatment components or duration, there is no evidence for a superior effect of a special treatment regimen. However, a final conclusion cannot be drawn due to the low number of studies comparing this aspect.

The overall methodological quality of the studies was found to be rather low. Some requirements, such as the blinding of care provider and patients, may not be met by multidisciplinary therapy. Other requirements, such as coverage of the method of randomization or concealment of treatment allocation, were insufficiently reported. An important point to consider is the small study population in some investigations. As a consequence, some studies were underpowered and some effects may not have been detected. For physicians it is fundamental to apply the evidence from systematic reviews only if the results are judged as clinically relevant and applicable. Thus, in accordance with the criteria recommended from Malmivaara *et al*. [62], we can state that generally the papers included are to be considered as clinically relevant and applicable.

Our systematic review is (as any review or meta-analysis) bound to publication bias and we cannot exclude that we may have missed some relevant trials, despite the fact that we used a highly sensitive search strategy, we did not have any language restrictions and consulted an experienced librarian, as recommended in Crumley *et al*. [63]. We did not apply a quantitative pooling of effect sizes but decided to summarize the findings by strength of evidence. Regarding the large heterogeneity of the studies, this seemed to us the more appropriate way to report the results. The decision to include or exclude some articles fulfilling the inclusion criteria, but not with the main focus on pain programme, is questionable. Our decision was based on the content of the programme and depending on the primary outcome measurements.

Multidisciplinary treatments are effective, but it is still not known which treatment components are really important and whether all patients (with different diagnoses, age, duration of pain, social background, etc.) would profit from all components. Future studies should compare different methods, settings and durations of multidisciplinary treatments and examine their connection with patient characteristics in more detail in order to detect differential effects. In order to achieve these demanding goals, multicentre studies may be useful. Further studies are needed to establish determinants or prognostic indicators of success, and to also define the therapeutic potential for a successful rehabilitation. As an upshot of this systematic review, we would recommend a stronger observance of methodological guidelines and the use of internationally accepted outcome measures in order to make studies more comparable, due to the extensive heterogeneity among the outcome measurements. An important task for the future will be the realization of more cost–benefit analyses in order to see which of the treatments are really worth being carried out. Health care insurances should finance and promote high quality of pain programmes that fulfil the minimal recommendations mentioned, representing the state of the art for multidisciplinary pain programmes.

In summary, this work may be helpful, especially for practising physicians in their daily work, in setting priorities more on disabilities and health-related quality of life in the treatment of chronic pain patients and also for researchers to optimally plan the outcome measurements and intervention modalities of future clinical trials.

Rheumatology key messages

- Multidisciplinary pain programme represent the state of the art of the management of complex, chronic, non-malignant pain patients.
- A standard requirement for a multidisciplinary pain programme is discussed.

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